

1. Indicate by means of a ✓, whether the description is that of a physical property (P), chemical property (C), physical change (PC) and/or chemical change (CC).

	(P)	(C)	(PC)	(CC)
<i>CaCl<sub>2</sub> has a melting point of 782°C</i>	✓		✓	
<i>CaCl<sub>2</sub> has a density of 2.15 g/cm<sup>3</sup></i>	✓			
<i>CaCl<sub>2</sub> is soluble in water</i>	✓		✓	
<i>In the presence of sulfuric acid, CaCl<sub>2</sub> reacts to form HCl and CaSO<sub>4</sub></i>		✓		✓
<i>When strongly heated, CaCl<sub>2</sub> produces chlorine gas</i>		✓		✓
<i>Water boils in a kettle</i>	✓		✓	
<i>Propane burns in a barbecue</i>		✓		✓
<i>An apple rots</i>		✓		✓
<i>Water is transparent</i>	✓			
<i>Steel has lustre</i>	✓			
<i>Water can exist as a gas, a liquid, and a solid at the same temperature</i>	✓			
<i>Aluminum can be pounded into thin sheets. It is malleable.</i>	✓			
<i>Diamond scratches glass because it is harder than glass.</i>	✓			
<i>Sand paper has a rough texture while silk is smooth</i>	✓			

2. In this course you will be required to make *qualitative* and *quantitative* observations. Which of the statements in question 1 would qualify as being qualitative (Q) and quantitative (QT)?

*The term qualitative is synonymous with quality and quantitative with quantity. Thus all but the first two statements are qualitative.*

3. What are the differences between a solid, a liquid, and a gas?

*Solids: solids keep their shape as the particles are closely packed together resulting in strong attractive forces*

*Liquids: liquids, like solids, have a definite mass but they take up the shape of the container; their particles are a little farther apart and as a result, the attractive forces are weaker.*

*Gases: like solids and liquids, gases have a definite shape but have an indefinite volume. This means that a gas will occupy the entire space of the container. Why? Their particles are very far apart resulting in very weak forces of attraction between them.*

4. What is the difference between a sample of matter that is *homogeneous* and one which is *heterogeneous*? Classify each of the following as homogeneous or heterogeneous:

soil, the atmosphere, Pepsi, gasoline, gold, Kool-Aid

*A homogeneous sample of matter is one that appears uniform throughout (ex. Water).*

*A heterogeneous sample of matter is one that does not appear uniform throughout (ex. Pizza)*

*Based on these definitions, the atmosphere, gasoline, gold, and Kool-Aid are homogeneous.*

5. What is the difference between a *mixture* and a *pure substance*? Classify each of the following as either a mixture or a pure substance:

Water, Blood, Atlantic Ocean, Iron, Brass, Uranium, Wine, Leather, Sodium Chloride (Salt)

*A mixture is something that is made up of more than one thing (or component). Its composition (what it is made up of) can vary. A pure substance, on the other hand, always has a constant composition and is only made up of one thing.*

*Water, Iron, Uranium, and Sodium Chloride are all pure substances.*

6. What is the difference between an *element* and a *compound*? Of the pure substances listed in question 5, which are elements?

*An element is a sample of matter that is made up of just one type of atom – it is a pure substance. A compound is a pure substance as well. A compound's particles are made up of more than one type of atom. However, all the particles in the sample are identical. Water is a compound made up of hydrogen and oxygen. Every water particle has the composition  $H_2O$*

*The elements in question 5 are Iron and Uranium. Water and Sodium Chloride are compounds. The others are mixtures, either homogeneous or heterogeneous.*

7. Of the substances listed in questions 4 and 5, which would be considered *solutions*? What is the difference between a *solute* and a *solvent*?

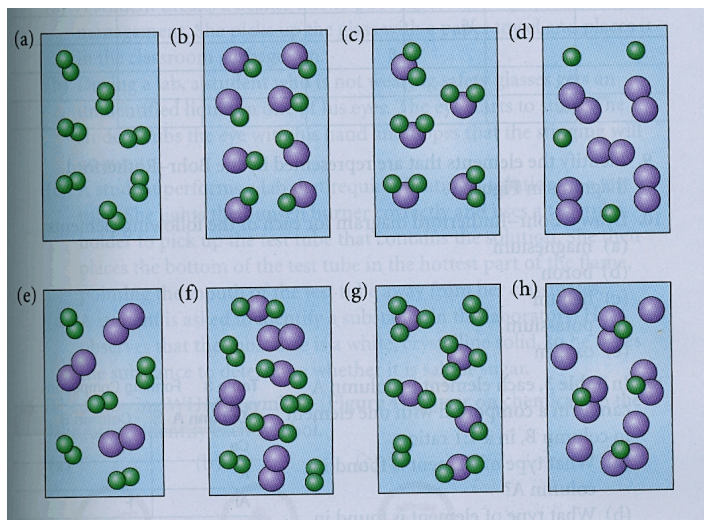
*A solution is a homogeneous mixture. The samples in questions 4 and 5 that are homogeneous mixtures are the atmosphere, gasoline, Kool-Aid, the Ocean, Brass and Wine.*

*The solute is the substance that is dissolved by the solvent. In a salt water solution, the salt is the solute and the water is the solvent. There is only so much solute that can be dissolved in the solvent. Once you reach the point where no more solute will dissolve, the solution is said to be saturated.*

8. The properties of a mixture are typically averages of the properties of its components. The properties of a compound may differ dramatically from the properties of the elements which combined to create the compound. For each process below, state whether the material being discussed is most likely a mixture or a compound, and state whether the process is a chemical change or a physical change.

- An orange liquid is distilled, resulting in the collection of a yellow liquid and a red solid  
*The orange liquid is a mixture. Distillation is the process of boiling (evaporating) a liquid and then cooling the gas in a separate area. The process is a physical change.*
- A colourless, crystalline solid is decomposed, resulting in a pale yellow-green gas and a soft, shiny metal  
*Decomposition is one of the chemical reactions you studied in grade 10. Decomposition means breaking down. In this case, the substance breaks down into two other substances. The colourless crystalline solid is thus a compound and the decomposition process is a chemical change.*
- A cup of tea becomes sweeter as sugar is added to it  
*Whether or not sugar is present, the cup of tea is a mixture (it consists of water and tannins from the tea itself... if the tea bag was left in the cup for a longer period of time, the tea would have a much stronger taste). Sugar is sweet by itself. As it is added to the water, the water becomes sweet. This means that the particles of sugar have dissolved but have not changed composition. The result of the tea/sugar is a mixture.*

9. Look carefully at the diagrams below. Decide whether each diagram represents an element, a compound, or a mixture. If the diagram represents a mixture, state how many elements and how many compounds are present in the mixture. Each different circle represents a different atom.



- (a) element (only one type of atom is present)
- (b) compound
- (c) compound
- (d) mixture of two elements
- (e) mixture of two elements
- (f) mixture of one compound and two elements
- (g) mixture of two compounds and one element
- (h) mixture of one compound and one element